

Table 2. Elemental Analysis of Bulk Samples. LTV Steel (HETA 95-0105), May 25, 1995

#	Location	Concentration (µg/g)														
		Al	As	Ba	Ca	Cr [†]	Co	Cu	Fe	Mg	Mn	Ni	Ti	V	Zi	Zr
K-1	slide gate repair	75000	31	420	210000	760	9.3	260	71000	58000	14000	45	1600	330	820	540
K-2	ladle lining	31000	(20)	48	44000	1900	16	7.4	22000	180000	2400	46	630	83	6.2	42
K-3	ladle dig out	24000	(10)	130	85000	790	5.5	11	50000	320000	5400	16	1100	300	(4)	230
K-4	ladle dig out	110000	(30)	82	200000	150	(4)	8.9	24000	180000	5200	nd	1300	120	nd	520
K-5	Stein slag separator	15000	nd	110	190000	990	nd	14	170000	49000	12000	nd	2000	910	89	140
K-6	#6 pit	140000	nd	190	310000	480	(9)	4.7	31000	58000	21000	(⁸)	4400	660	6.5	1100
K-7	#1 vessel	77000	64	95	150000	190	9.4	43	64000	150000	8800	17	720	190	2000	110
K-8	#2 vessel	63000	nd	290	250000	290	9.4	78	49000	88000	11000	30	1900	220	3400	470
K-9	LMF VCP	9100	nd	59	55000	130	(3)	28	26000	350000	2700	nd	480	96	700	99
K-10	#1 vessel	88000	61	150	340000	120	14	29	15000	63000	9900	17	1500	53	610	220
K-11	bin floor	18000	nd	120	150000	140	5.3	68	37000	190000	6200	23	610	150	3900	190
K-12	Syn Slag 60 (virgin)	2500	nd	13	370000	(7)	nd	(0.4)	1800	200000	110	nd	120	4.2	nd	19

µg/g = Micrograms of contaminant per gram of bulk sample.

nd = None detected (see Appendix B for analytical limits).

() = Value is between the LOD and LOQ (See Appendix B).

[†] Visual color comparison using a K-2810 CHEMets Chromate kit did not detect hexavalent chromium. The limit of estimation for hexavalent chromium in this sample set was 10µg Cr(VI) per gram of sample.

Table 3
pH of Bulk Samples*
LTV Steel (HETA 95-0105), May 25, 1995

Sample Number	Location	pH
K-1	slide gate repair	9.0
K-2	ladle lining	9.0
K-3	ladle dig out	9.5
K-4	ladle dig out	10.5
K-5	Stein slag separator	11.0
K-6	#6 pit	9.5
K-7	#1 vessel	10.5
K-8	#2 vessel	10.5
K-9	LMF VCP	10.5
K-10	#1 vessel	10.0
K-11	bin floor	9.7
K-12	Syn Slag 60 (virgin)	10.0

*For pH determination, approximately 0.1 g of each sample was weighed and then moistened with 0.1 ml deionized water. The pH was estimated using calorimetric indicator strips.

Table 4
Summary of Findings for Ten Employees with Current Skin Problem
Basis for Determining Work-relatedness of Employee Dermatitis
LTV Steel (HETA 95-0105)

Employee	Dermatologist Diagnosis ¹	Current History ²	PE: Work- Related ³	PE: Non Work- Related ⁴
1	X ⁵	X	X	
2	X	X		
3	X	X	X	
4	X	X	X	
5	X	X	X	
6		X	X	
7	X	NE ⁶	NE	
8				X
9				X
10				X

- 1 Medical records with dermatologist diagnosis of dermatitis potentially related to workplace dust exposure.
- 2 History of recent dermatitis and evidence supporting relationship between dermatitis and workplace dust exposure (temporal relationship, anatomical distribution of dermatitis).
- 3 Physical examination on May 25, 1995, revealing evidence of dermatitis consistent with airborne contact dermatitis, or exacerbation of underlying skin condition by airborne dust.
- 4 Physical examination on May 25, 1995, revealing no evidence work-related dermatitis
- 5 X = factor present.
- 6 NE = Employee not examined or interviewed by NIOSH representatives.

Shaded area includes those seven employees identified as having a work-related irritant dermatitis or an exacerbation of an underlying skin condition associated with contact with airborne dust in the BOF area.

Appendix A. Analytical Limits, Air Samples. LTV Steel, HETA 95-0105

Analyte	LOD (µg/filter)	LOQ (µg/filter)	MDC (µg/m ³)	MQC (µg/m ³)
Aluminum	0.5	1.6	0.6	2.1
Arsenic	1.	3.1	1.	4.0
Barium	0.02	0.040	0.03	0.051
Beryllium	0.02	0.064	0.03	0.082
Calcium	2.	4.1	3.	5.3
Cadmium	0.07	0.21	0.09	0.27
Chromium	0.4	1.2	0.5	1.5
Cobalt	0.2	0.62	0.3	0.79
Copper	0.05	0.16	0.06	0.21
Iron	0.6	1.9	0.8	2.4
Lead	0.6	1.8	0.8	2.3
Lithium	0.05	0.17	0.06	0.22
Magnesium	0.7	2.3	0.9	2.9
Manganese	0.03	0.091	0.04	0.12
Molybdenum	0.2	0.43	0.3	0.55
Nickel	0.4	1.3	0.5	1.7
Phosphorus	4.	11.	5.	14.
Platinum	2.	4.1	3.	5.3
Selenium	0.9	3.0	1.	3.8
Silver	0.04	0.13	0.05	0.17
Sodium	5.	17.	6.	22.
Tellurium	0.7	2.3	0.9	2.9
Thallium	2.	4.0	3.	5.
Titanium	0.06	0.19	0.08	0.24
Vanadium	0.2	0.39	0.3	0.50
Yttrium	0.02	0.041	0.03	0.053
Zinc	0.07	0.22	0.09	0.28
Zirconium	0.2	0.36	0.3	0.46

LOD = Analytical limit of detection.

LOQ = Analytical limit of quantitation.

MDC = Minimum detectable concentration based upon an average sample volume of 780 liters.

MQC = Minimum quantifiable concentration based upon an average sample volume of 780 liters.

µg/m³ = Micrograms of contaminant per cubic meter of air.

Appendix B. Analytical Limits, Bulk Samples. LTV Steel, HETA 95-0105

The limits of detection (LOD) and quantitation (LOQ) were calculated from NIOSH LODs and LOQs for NIOSH method 7300, modified for microwave digestion of filters, and have been corrected for units ($\mu\text{g/g}$). Since all samples were diluted due to matrix interferences and high analyte concentrations, the LODs and LOQs should be multiplied according to the sample dilutions. The reported results for analytes not listed in the following table correspond with a two-fold (2x) dilution.

Sample	Dilution	Analyte
K-1	1x	As
K-2	5x	Al, Ca, Cr, Ti
K-3	5x	Cr, Mg, Mn, Zn
K-4	5x	As, Ca, Cr, Mg, Mn, Ti, Zn
K-5	10x	all analytes
K-6	5x	Ca, Co, Cr, Cu, Fe, Mg, Mn, Ni, Ti, V, Zn, Zr
K-8	5x	Al, Ca, Cr, Mg, Mn, Ni, Zn
K-9	5x	Al, Ca, Mg, Mn, Ti, Zn, Zr
K-10	5x	Ca, Mg, Mn, Ti, Zn
K-11	1x	Co
	5x	Mn, Ti, Zn
K-12	5x	Ca, Mg, Ti

The limits of detection and quantitation for an undiluted sample are as follows:

Analyte	LOD ($\mu\text{g/g}$)	LOQ ($\mu\text{g/g}$)
Aluminum	2.	6.4
Arsenic	4.	13.
Barium	0.05	0.16
Calcium	5.	17.
Chromium	2.	4.6
Cobalt	0.8	2.5
Copper	0.2	0.64
Iron	3.	7.4
Magnesium	3.	9.1
Manganese	0.2	0.37
Nickel	2.	5.1
Titanium	0.3	0.76
Vanadium	0.5	1.6
Zinc	0.3	0.87
Zirconium	0.5	1.5

$\mu\text{g/g}$ = Micrograms of contaminant per gram of bulk sample.

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**HEALTH HAZARD EVALUATION
REPORT**

**HETA 95-0105-2540
LTV STEEL COMPANY
CLEVELAND, OHIO**

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PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer and authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to federal, state, and local agencies; labor; industry; and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

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